CLAIMS

1. A medical assembly for local delivery of at least one therapeutic substance to an internal body tissue target area comprising:

(a) a catheter having a distal end and a proximal end;

(b) a delivery lumen on said catheter, said lumen extending from the distal end of the catheter to the proximal end of the catheter for the delivery of a therapeutic substance therethrough; and

(c) a first transducer supported by at least a portion of the distal end of the catheter assembly, said first transducer being supported by said catheter distal end at a preselected number of anchoring points, wherein an inner surface of the transducer is positioned at a controlled and preselected distance from an outer surface of the catheter, wherein said distance defines a gap between said outer surface of the catheter and said inner surface of the transducer.

2. The medical assembly of Claim 1, wherein said gap is occupied by a low density material.

3. The medical assembly of Claim 2, wherein said low density material is selected from the group of ambient air, oxygen, nitrogen, helium, open-cell polymer foam, closed-cell polymer foam and mixtures thereof.

4. The medical assembly of Claim 1, wherein said transducer is tubular.

5. The medical assembly of Claim 1, wherein said distance is greater than about 25 μm in length.

6. The medical assembly of Claim 1, further comprising perfusion holes disposed at the proximal end of the catheter.

7. The medical assembly of Claim 1, wherein said at least one therapeutic substance is selected from a group including antineoplastic, antiinflammatory, antiplatelet, anticoagulants,

fibrinolytic, thrombin inhibitor, antimitotic, and antiproliferative substances and mixtures thereof.

8. The medical assembly of Claim 1, further comprising:

a balloon incorporated at said distal end of the catheter, in fluid communication with said lumen, said balloon being formed from a membrane having pores, wherein said transducer is disposed within said balloon.

9. The medical assembly of Claim 8, wherein the pores are sized from about 0.3 μm to about 2.5 μm.

10. The medical assembly of Claim 1, further comprising:

a balloon incorporated at said distal end of the catheter, disposed distally from said transducer, said balloon being substantially impermeable to said at least one therapeutic substance.

11. The medical assembly of Claim 1, further comprising:

a second transducer supported by at least a portion of the distal end of the catheter assembly, each transducer having a proximal end and a distal end, wherein the distal end of said first transducer is positioned at a preselected distance from the proximal end of said second transducer.

12. A medical assembly for local delivery of a therapeutic substance to an internal body tissue target area comprising:

(a) a catheter having a distal end and a proximal end;

(b) a delivery lumen on said catheter, said lumen extending from the distal end of the catheter to the proximal end of the catheter for the delivery of a therapeutic substance therethrough; and

(c) a plurality of transducers supported by at least a portion of the distal end of the catheter assembly, each transducer having a proximal end and a distal end, wherein the distal end of a transducer is positioned at a preselected distance from the proximal end of an adjacent transducer.

13. The medical assembly of Claim 11, wherein each of said plurality of transducers are supported by said catheter distal end at a preselected number of anchoring points, wherein an inner surface of each transducer is positioned at a preselected distance from an outer surface of the catheter, wherein said distance defines a gap between said outer surface of the catheter and said inner surface of the transducer.

14. A medical assembly for local delivery of a therapeutic substance to an internal body tissue target area comprising:

(a) a catheter having a distal end and a proximal end;

(b) a first transducer supported by at least a portion of the distal end of the catheter assembly, said first transducer being supported by said catheter distal end at a preselected number of anchoring points, wherein an inner surface of said first transducer is positioned at a preselected distance from an outer surface of the catheter, and wherein said distance defines a gap between said outer surface of the catheter and said inner surface of said first transducer;

(c) a delivery lumen on said catheter, said lumen extending from the distal end of the catheter to the proximal end of the catheter for the delivery of a therapeutic substance therethrough; and

(d) a balloon incorporated at said distal end of the catheter, in fluid communication with said lumen, wherein said first transducer is disposed within said balloon.

15. The medical assembly of Claim 14, further comprising:

(b) a second transducer supported by at least a portion of the distal end of the catheter assembly, said first and second transducer each having a proximal end and a distal end, wherein the distal end of said first transducer is positioned at a preselected distance from the proximal end of said second transducer.

16. The medical assembly of Claim 15, wherein said transducers are supported by said catheter assembly at a preselected number of anchoring points, and wherein an inner surface of each transducer is positioned at a preselected distance from an outer surface of the catheter, and wherein said distance defines a gap between said outer surface of the catheter and said inner surface of the transducer.

17. A method for delivering a therapeutic substance to an internal body tissue target area, the method comprising the acts of:

(a) providing a catheter having a distal end and a proximal end, and further having a delivery lumen, said delivery lumen extending from the distal end of the catheter to the proximal end of the catheter for delivery of a therapeutic substance therethrough;

(b) further providing a transducer supported by at least a portion of the distal end of the catheter assembly, said transducer being supported by said catheter distal end at a preselected number of anchoring points, wherein an inner surface of the transducer is positioned at a preselected distance from an outer surface of the catheter, wherein said distance defines a gap between said outer surface of the catheter and said inner surface of the transducer;

(c) positioning said catheter proximate said internal body tissue;

(d) causing a therapeutic substance to elute from said delivery lumen at the distal end of the catheter; and

(e) transmitting an electrical signal to said transducer.

18. The method of Claim 17 wherein said therapeutic substance is selected from a group including antineoplastic, antiinflammatory, antiplatelet, anticoagulants, fibrinolytic, thrombin inhibitor, antimitotic, and antiproliferative substances and mixtures thereof.

19. A method of treating an internal body tissue with a therapeutic substance comprising:

locally delivering the therapeutic substance in the vicinity of the internal body tissue;

generating ultrasonic energy in the vicinity of the internal body tissue;

transporting the therapeutic substance, penetrating into the internal body tissue via the ultrasonic energy; and

amplifying the applied ultrasonic energy by manipulating an electronic signal driving the ultrasonic energy generation.

20. A method according to Claim 19 further comprising:

amplifying the applied ultrasonic energy by interposing a gap between a catheter for delivering the therapeutic substance and a transducer for generating the ultrasonic energy.